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## BOOK REVIEWS AND NOTES.

### CONTRIBUTIONS TO THE FOUNDING OF THE THEORY OF TRANSFINITE NUMBERS.

By *Georg Cantor*. Translated and provided with an Introduction by *Philip E. B. Jourdain*. Chicago and London: Open Court Publishing Company. Pages, 212, Price, \$1.25.

Everybody knows and constantly uses the whole numbers, 1, 2, 3, and so on; and uses the word "infinite" for something which, like the above series of numbers, has no end. In fact, however large a number is, we can always think of a still larger one, and thus we never get to an end of the above series. But the great German mathematician Georg Cantor, who is still living at Halle, first saw about 1870 that in certain branches of mathematics we must contemplate a new series of numbers each of which is greater than any of the above finite numbers, and thus has a place *after all* the finite numbers; just as in the spectrum a shade of red has a place after all the innumerable shades of orange though we cannot say that there is a last shade of orange. Cantor spent years in getting himself and others accustomed to the strange idea of infinite or "transfinite" numbers, which, though each consisted of an unending set of units, could be thought of as complete wholes much as "all the points in the line AB" denotes an infinite set and can yet be treated as a completed whole. With this end in view Cantor studied deeply the arguments of philosophers, theologians and mathematicians about the infinite. At last, in 1895 and 1897, he succeeded in putting the results of nearly thirty years of work into a logical form which any intelligent person will not find very hard to understand. It is these famous essays that are here translated. In the introduction Mr. Jourdain has shown in detail how the new ideas grew from the work of Cantor's predecessors and in Cantor's own mind, and how these ideas must now be studied and used by *all philosophers, theologians, logicians, those interested in the foundations of the science of number and all mathematics*, and those who think about the ultimate constitution of space and matter, besides all mathematicians. This book appeals to any one who wants to understand one of the main things that has revolutionized many of the methods and problems and applications of modern mathematics and philosophy of mathematics and philosophy in general, and feels sympathy with those who want to know what numbers and fractions and space and matter are.

Why should mathematics interest everybody? Mere calculation is not interesting except to a few people. But even letting the mind rest on great and firm eternal truths is enchanting; living and working to find out more about them is absorbing. *Mathematics is one of the few paths to truth, and*

*the search for truth is the religion of all thinking men and women nowadays.* Mathematics is one of the most living of studies when treated historically so that we can follow the birth and development of great ideas. Thinking teachers know how attractive and indispensable it is to introduce students to new ideas and the truths they mirror, slowly and, if possible, as the actual discoverers were introduced to them.  $\phi$

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NAPIER TERCENTENARY MEMORIAL VOLUME. Edited by *Cargill Gilston Knott*. Published for the Royal Society of Edinburgh by Longmans, Green and Co., London and New York, 1915. Pp. xii, 441. Price \$7 net or 2ls. net.

This magnificent volume contains the addresses and essays communicated to the international congress held at Edinburgh in July, 1914, in celebration of the tercentenary of the first publication of John Napier's system of logarithms. It is superbly printed and bound, contains a frontispiece in color from the well-known portrait of Napier in the University of Edinburgh and has several other plates. This congress, of which a full account is given by Dr. Knott, was the last international congress of any kind held before the European war broke out; and there is a certain melancholy interest in glancing through this volume and seeing contributions of great value not only from Great Britain but also from America, France, Germany, Italy, and even Turkey. The communications fall into two groups. Some treat of the life and work of Napier, and some with subsequent developments of the logarithmic idea and contain valuable additions to our means of calculation. But the greatest interest, perhaps, will center in the contributions of the first group, and of these the most striking is the inaugural address by Lord Moulton, in which an attempt is made to reconstruct the gradual evolution of Napier's great discovery. Most of us know that Lord Moulton, in his career at the Bar, had great experience in the study of inventions, and this address of his is one of the most important contributions to the history of mathematics that has been made in recent years. Indeed the whole volume is quite indispensable for the future historian of mathematics. We may mention that Prof. F. Cajori shows how the history of the subject has been mangled by authoritative historians of the past, and that there are also notable contributions made by Dr. J. W. L. Glaisher, Prof. D. E. Smith, Prof. G. A. Gibson, and many others. Finally it must be mentioned that a copy of the rare work of Bürgi was lent to the congress by the town library of Danzig and it is fully described in this volume.  $\phi$

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A COURSE OF MODERN ANALYSIS: An Introduction to the General Theory of Infinite Processes and of Analytic Functions; with an Account of the Principal Transcendental Functions. By *E. T. Whittaker* and *G. N. Watson*. Second edition, completely revised. Pp. vi, 560. Cambridge (England): University Press, 1915. 18s. net.

The first edition (by Professor Whittaker alone) of this work was published in 1902, and in the preparation of the second edition Professor Whittaker has been most ably helped by Mr. Watson. To Mr. Watson the new chapters on Riemann Integration, Integral Equations, and the Riemann Zeta-Function